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# Reducing the Spread of Aquatic Invasive Species and Fish Pathogens in the Great Lakes: The Role of Bait Dealers



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## **EXECUTIVE SUMMARY**

Fish pathogens and aquatic invasive species (AIS) are an ongoing challenge in the Great Lakes region. Their presence and the potential for their spread have resulted in local, state, and federal concerns and responses, including regulatory actions and educational programs aimed in part at bait dealers. The U.S. Department of Agriculture Animal and Plant Health Inspection Service (USDA-APHIS) first issued an emergency order in 2006 in response to the rapid spread of viral hemorrhagic septicemia (VHS) in the Great Lakes region, targeting the actions of both bait dealers and aquaculture operations. States and provinces in the region have since issued their own regulations for bait dealers, and developed educational programs targeting anglers who may get information from bait dealers. However, little is known about how target audiences, such as bait dealers, have responded to these efforts.

Our aim in this study was to assess: (1) how bait dealers in the Great Lakes region have responded to regulations regarding the sale and transport of baitfish; (2) how their responses to regulations are related to their knowledge and awareness of and concern about pathogens, and constraints on their compliance; and (3) if they were aware of and concerned about AIS, and if they engaged in any efforts to educate their customers about them.

We conducted a mail survey of bait dealers in the Great Lakes region. Bait dealer license records were obtained from each of the six states and provinces selected for the study (Indiana, Michigan, New York, Ohio, Ontario, and Wisconsin). The questionnaire included sections on awareness and knowledge of AIS and fish pathogens and the related regulations, behavioral responses to the presence of AIS and fish pathogens, concern about AIS and fish pathogens, sources used to obtain information about the regulations, factors potentially influencing compliance with the regulations, opinions about the regulations, and bait dealer business and owner characteristics. The survey was initiated in September 2013. Up to three follow-up mailings were sent to non-respondents over the course of the next four weeks to encourage their response. A telephone follow-up survey of 197 non-respondents (20-50 per state) was implemented approximately two months after the first mailing of the questionnaire to understand how non-respondents differed from respondents.

Of the 2,428 questionnaires mailed, 87 were undeliverable, and 929 completed questionnaires were returned. The adjusted response rate was 40%. Results of the non-respondent interviews with bait dealers indicated little difference from respondents in terms of the type of bait business run or the type of bait sold. Respondents were more likely to have heard of AIS and VHS than non-respondents, but not more likely to say they know something about them. Respondents expressed more concern about AIS and fish diseases in the Great Lakes region than non-respondents. They were no more or less likely to say they were familiar with the USDA-APHIS or state regulations than non-respondents.

### **Bait Dealers' Awareness of Fish Diseases and AIS**

Most bait dealers were aware of VHS and AIS and generally knowledgeable about AIS and fish diseases. They were concerned about AIS and VHS in the Great Lakes region, with two-thirds believing that VHS is a major threat to the health of fish populations in the region. Most reported being moderately or very familiar with their state or provincial regulations. They felt it

was important to follow the regulations and were trying to follow them. Fewer were familiar with the USDA-APHIS regulations and a sizable and variable proportion (26-57% depending on the state) thought those regulations did not apply to them. We found that bait dealers who were aware of VHS, AIS and the regulations were more likely to be trying to follow the regulations and used a variety of methods to inform their customers about what to do with unwanted baitfish and how to prevent the spread of AIS. These results suggest that little additional effort is needed to inform bait dealers about AIS and fish diseases generally, except perhaps in Indiana where bait dealers were less likely to be aware and less certain in their knowledge. However, bait dealers might benefit from more information about the specifics of the regulations, especially USDA-APHIS regulations.

### **Actions to Prevent the Spread of Fish Diseases and AIS**

Bait dealers are taking a variety of actions within their businesses to prevent the spread of fish diseases and AIS. We discovered a great deal of inter-state/province variation in these efforts. For example, selling “certified” bait is a very common action in Michigan and New York, but uncommon in the other states and provinces. Ontario bait dealers are much more likely than bait dealers in other states to try to tell if AIS are present in the baitfish they collect before selling them.

Over 80% of bait dealers in Michigan, Ohio, Ontario, and Wisconsin communicated by at least one method with their customers about what to do with unwanted baitfish and how to prevent the spread of AIS. Bait dealers in Ontario and Wisconsin used more methods on average than bait dealers in other states. This suggests that anglers frequenting these businesses had more opportunities for exposure to the messages. Bait dealers were more likely to communicate messages about baitfish than about AIS. While most bait dealers sell baitfish and therefore the emphasis on messages about what to do with unwanted baitfish seems appropriate, many businesses are also engaged in other activities, such as selling fishing equipment and marina operations. Consequently, providing bait dealers with more educational materials about preventing the spread of AIS might provide an additional opportunity for communicating those messages with anglers.

### **Factors Influencing Compliance with State/Provincial Regulations**

Bait dealers who indicated that they wanted to do all they could to prevent the spread of fish diseases were more likely to try to follow the state/provincial regulations regarding the sale and transport of baitfish. They were also more likely to try to follow the state/provincial regulations regarding the sale and transport of baitfish if they believed:

- The spread of fish diseases is bad for my business.
- Regulations about the transport of baitfish are needed to keep fish diseases from spreading.
- If I follow the regulations, that will help limit the spread of fish diseases.

Bait dealers who believed that other dealers followed the regulations and that other dealers thought it was important to follow the regulations were themselves more likely to try to follow

the regulations. Finally, bait dealers who thought they had a good understanding of the issues related to AIS and found the regulations easy to follow were more likely to say they were trying to follow the regulations.

These results suggest that future communication with bait dealers that emphasize/reiterate these various beliefs might be particularly effective ways of increasing compliance with the regulations. For example, pointing out in messages how the spread of fish diseases can negatively impact bait businesses could lead to increased compliance. Also messages that emphasize “others in your situation are doing it and think it is important, so you should do it too” could be effective at increasing compliance with the regulations. Finally, efforts to educate bait dealers further regarding the environmental issues related to AIS will likely help with compliance, as will actions that make compliance easier, such as reducing paperwork, simplifying the rules, etc. It is also important to keep in mind in any communication efforts with bait dealers that less than one-quarter have a college degree.

### **Additional Information Needs**

Some states and provinces may be considering modifying the current regulations regarding the sale and transport of baitfish. This would be an excellent opportunity to gather information from bait dealers on what changes they would like to see. We found that bait dealers in different states had different levels of awareness and varied a great deal in the types of actions they took. These differences may relate to variation in regulations or messages across states/provinces. In the context of potential regulations changes, bait dealers could be asked what is working for them and what changes they would like to see. This would also involve bait dealers in the process, and address concerns expressed in this survey that their opinions were not asked for or considered.

We found that many bait dealers were communicating with their customers about what to do with unwanted baitfish and how to prevent the spread of AIS. As a key communication channel to anglers, would bait dealers be willing to do more, and if so, how could managers and educators best support them? Recent research in Wisconsin has shown that bait dealers who felt they knew more about AIS and those supported by personal contact with local AIS experts were more willing to educate their customers. Would these findings be similar in other states and provinces?

## **ACKNOWLEDGMENTS**

We wish to thank the many state and provincial agency representatives who assisted us in obtaining the sample of bait dealers in each state and province in our study area. We also wish to thank the state and provincial representatives who attended a workshop in Ann Arbor, MI in May 2014, and provided valuable insight into the results of our research.

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## TABLE OF CONTENTS

Executive Summary .....	ii
Bait Dealers' Awareness of Fish Diseases and AIS .....	ii
Actions to Prevent the Spread of Fish Diseases and AIS .....	iii
Factors Influencing Compliance with State/Provincial Regulations .....	iii
Additional Information Needs .....	iv
Acknowledgments.....	v
Table of Contents .....	vi
List of Tables .....	vii
Introduction.....	1
Methods.....	2
Sample Selection.....	2
Questionnaire Design.....	3
Mail Survey Implementation .....	3
Non-respondent Telephone Follow-up .....	3
Analysis.....	3
Results and Discussion .....	4
Survey Response .....	4
Non-response Bias Analysis .....	4
Characteristics of Bait Dealers and Their Businesses in the Great Lakes Region.....	5
Awareness and Knowledge of AIS and Fish Diseases .....	7
Behavioral Responses to the Presence of AIS and Fish Diseases .....	8
Level of Concern Regarding AIS and Fish Diseases.....	12
Familiarity with Regulations.....	12
Sources of Information about Regulations .....	13
Opinions about Regulations.....	14
Compliance with Regulations.....	18
Conclusions and Recommendations .....	24
Bait Dealers' Awareness of Fish Diseases and AIS .....	24
Actions to Prevent the Spread of Fish Diseases and AIS .....	24
Factors Influencing Compliance with State/Provincial Regulations .....	25
Additional Information Needs .....	26
Literature Cited .....	26
Appendix A: Mail Questionnaire.....	28
Appendix B: Additional Tables .....	39

## LIST OF TABLES

Table 1. Response rate by state or province. ....	4
Table 2. Socio-demographic characteristics of respondents by state or province. ....	5
Table 3. Business characteristics by state or province.....	6
Table 4. Types of bait sold by bait dealers by state or province.....	7
Table 5. Awareness of aquatic invasive species and VHS by state or province.....	8
Table 6. Bait dealer knowledge regarding aquatic invasive species and fish diseases by state or province.....	9
Table 7. Actions taken by bait dealers to prevent the spread of aquatic invasive species or fish diseases by state or province. ....	10
Table 8. Information distributed by bait dealers to inform customers about what to do with unwanted baitfish and how to prevent the spread of AIS, by state or province. ....	11
Table 9. Bait dealer level of concern about aquatic invasive species and fish diseases in the Great Lakes region by state or province. ....	12
Table 10. Familiarity with USDA and state/province regulations regarding the sale and transport of baitfish by state or province.....	13
Table 11. Sources used by bait dealers for information about regulations intended to prevent the spread of fish diseases and aquatic invasive species, by state or province.....	14
Table 12. Trustworthiness of information sources according to bait dealers, overall and by state or province. <sup>a</sup> .....	15
Table 13. Best ways according to bait dealers to reach them with information about new regulations by state or province. ....	16
Table 14. Bait dealer opinions about regulations, by state or province.....	17
Table 15. Importance of following and trying to follow the USDA-APHIS and state/province regulations regarding transport and sale of baitfish by state or province. ....	19
Table 16. Behavioral and normative beliefs associated with following the regulations regarding the sale and transport of baitfish. ....	20
Table 17. Correlation of behavioral, normative, and control beliefs with trying to follow state/provincial and USDA-APHIS regulations.....	22
Table 18. Control beliefs associated with following the regulations regarding the sale and transport of baitfish. ....	23



## INTRODUCTION

Fish pathogens and aquatic invasive species (AIS) are an ongoing challenge in the Great Lakes region. Their presence and the potential for their spread have resulted in local, state, and federal concerns and responses, including regulatory actions and educational programs aimed in part at bait dealers. The U.S. Department of Agriculture Animal and Plant Health Inspection Service (USDA-APHIS) first issued an emergency order in 2006 in response to the rapid spread of viral hemorrhagic septicemia (VHS) in the Great Lakes region, targeting the actions of both bait dealers and aquaculture operations. States and provinces in the region have since issued their own regulations for bait dealers, and developed educational programs targeting anglers who may get information from bait dealers. However, little is known about how target audiences, such as bait dealers, have responded to these efforts.

Lauber et al. (2009) conducted exploratory research on compliance with VHS regulations and recommendations in the Great Lakes. Based on a series of 45 interviews with representatives of fish and wildlife agencies, extension educators, and stakeholder groups, they reported that the compliance of bait dealers with VHS regulations was perceived to be inconsistent. Interview respondents believed that factors influencing compliance included awareness of and concern about VHS and perceptions about the financial costs of compliance, the feasibility of compliance, the level of enforcement of regulations, the effectiveness of the regulations at addressing VHS, and the fairness of the regulations and the process through which they were developed.

While Lauber et al.'s (2009) research identified a number of important factors that could influence compliance with VHS regulations, it was designed to be exploratory rather than a systematic, quantitative assessment of the relative importance of each of these factors in relation to compliance. The data from the Lauber et al. (2009) study provide a useful foundation from which to develop standardized surveys of representative samples of bait dealers using quantitative methods, to better characterize the relative importance of factors influencing regulatory compliance and provide additional guidance to decision makers about how to most effectively design and communicate about regulations to address fish pathogens and AIS.

The survey reported on here focused specifically on bait dealers. (A similar study was conducted with anglers (see Connelly et al. 2014.) Our aim in this study was to assess: (1) how bait dealers in the Great Lakes region have responded to regulations regarding the sale and transport of baitfish; (2) how their responses to regulations are related to their knowledge and awareness of and concern about pathogens, and constraints on their compliance; and (3) if they were aware of and concerned about AIS, and if they engaged in any efforts to educate their customers about them.

We applied concepts from the Integrated Model of Behavioral Prediction (IMBP; Fishbein and Yzer 2003; Fishbein and Ajzen 2009) to identify beliefs held by bait dealers that were related to their compliance or attempted compliance with the regulations. We measured specific behavioral, normative, and control beliefs related to compliance with the regulations. Behavioral beliefs are beliefs about the consequences of performing relevant behaviors (Fishbein and Ajzen 2009). For example, a bait dealer might believe that following the regulations will help limit the

spread of fish diseases. Normative beliefs are beliefs about the degree to which a behavior is being performed by others (e.g., “most bait dealers follow the recommendations”) and beliefs about the degree to which others think a behavior should be performed (e.g., “most bait dealers think it is important that we follow the recommendations”). Control beliefs are beliefs about the presence or absence of situational factors that enhance or impede performance of the behavior (e.g., do bait dealers perceive it costs too much or takes too much time to follow the regulations) and perceptions about whether these factors will make the behavior easier or more difficult (e.g., if bait dealers find the regulations confusing it might be harder to follow them). Understanding which beliefs are held by the greatest number of people and held most strongly can inform approaches used to try to influence compliance with the regulations. For example if bait dealers find the regulations confusing, efforts to simplify the regulations or communicate them more simply might be the best course of action. Or if bait dealers believe following the regulations will help limit the spread of fish diseases, future communication might appeal to their desire to protect the environment as a reason for them to comply with the regulations.

The specific objectives of the study were to:

1. Characterize bait dealers and their businesses in the Great Lakes region;
2. Assess bait dealer awareness and knowledge of fish pathogens and AIS;
3. Assess their behavioral responses to the presence of fish pathogens and AIS;
4. Assess bait dealer level of concern regarding fish pathogens and AIS;
5. Assess bait dealer awareness of the regulations regarding the sale and transport of baitfish;
6. Assess sources of information used to learn about the regulations, and trust in those sources;
7. Characterize bait dealers opinions about the regulations; and
8. Understand the importance of various factors that could enhance or constrain their compliance with the regulations.

The study area was the Great Lakes region, including all states and provinces bordering the Great Lakes. A study of bait dealers in all nine states and provinces surrounding the Great Lakes was not financially feasible. Therefore, we chose to focus on bait dealers in six states and provinces using two primary selection criteria. The first criterion was to have diversity of state and provincial responses to AIS and fish pathogens in terms of regulations. We used the earlier work of Heck et al. (2013) which included interviews and a brief survey with state and provincial representatives to identify this diversity. The second criterion was more practical and involved our ability to access to bait dealer license records.

## **METHODS**

### **Sample Selection**

Bait dealer license records were obtained from each of the six states and provinces selected for the study (Indiana, Michigan, New York, Ohio, Ontario, and Wisconsin). All bait dealers were included in the sample with two exceptions. The first exception was in Wisconsin where the license form had a check box that bait dealers check if they do not want their name and address

disclosed. Contact information for these bait dealers (approximately 75% of the population) was not available for this study. The second exception was in Ontario, which has more bait dealers than we could afford to survey. We chose a sample of 400 bait dealers whose businesses were located closest to Lake Ontario. The reason for this decision was that many of the current concerns about AIS and fish pathogens revolve around introduction to the region through the Great Lakes and this would make the results from Ontario most comparable to the results from the states.

### **Questionnaire Design**

The questionnaire included sections on awareness and knowledge of AIS and fish pathogens and the related regulations, behavioral responses to the presence of AIS and fish pathogens, concern about AIS and fish pathogens, sources used to obtain information about the regulations, factors potential influencing compliance with the regulations, opinions about the regulations, and bait dealer business and owner characteristics. The full text of the U.S. questionnaire is available in Appendix A. The Ontario questionnaire was identical to the U.S. questionnaire, except for the omission of the questions concerning USDA-APHIS.

### **Mail Survey Implementation**

The mail survey was initiated in September 2013. Up to three follow-up mailings were sent to non-respondents over the course of the next four weeks to encourage their response.

### **Non-respondent Telephone Follow-up**

A telephone follow-up survey of 197 non-respondents (20-50 per state) was implemented approximately two months after the first mailing of the questionnaire to understand how non-respondents differed from respondents. (Ontario did not allow telephone contact with bait dealers, so they were not included in the non-respondent follow-up.) Key questions from the mail survey were asked over the telephone about bait business characteristics, awareness of AIS and VHS, awareness of regulations regarding the sale and transport of baitfish, and actions taken to inform customers about AIS and what to do with unwanted baitfish. The list of these questions can be found in Appendix B.

### **Analysis**

Data from returned mail questionnaires were entered into the computer and analysis was done using SPSS (IBM SPSS Statistics 20). Chi-square and Scheffe's test were used to test for statistically significant differences between states/provinces at the  $P \leq 0.05$  level.

Data reported by state/province are unweighted and reflect the number of people who responded to the survey from that state/province. However, to make statements about bait dealers in the six states and provinces surveyed as a whole, respondent data was weighted in proportion to the number of bait dealer licenses issued in each state, or in the case of Ontario, the portion of the province that was within our study area.

## RESULTS AND DISCUSSION

### Survey Response

Of the 2,428 questionnaires mailed, 87 were undeliverable, and 929 completed questionnaires were returned. The adjusted response rate was 40%. Response rate differed by state and province with Ontario being the highest and Indiana the lowest (Table 1). The response rate to the mail survey was acceptable and the number of respondents was sufficiently large for all the statistical tests that we wanted to perform.

**Table 1.** Response rate by state or province.

State or Province	Initial Sample Size	Responses	Response rate adjusted for undeliverables
Indiana	359	88	25.4
Michigan	554	217	39.9
New York	513	213	44.3
Ohio	503	176	36.1
Ontario	400	194	50.1
Wisconsin	99	39	41.1
Overall	2,428	929*	39.7

\*The overall responses include two respondents whose state or province could not be determined.

### Non-response Bias Analysis

When non-respondents were contacted by telephone a number of them, particularly in Indiana and New York, indicated that they did not sell bait. They explained that they obtained their bait dealer license because they wanted to personally collect more baitfish than was allowed under the current regulations. These individuals were not interviewed as they were not considered to be part of the bait dealer population of interest in this study.

Results of the 197 completed non-respondent interviews with bait dealers indicated little difference from respondents in terms of the type of bait business run or the type of bait sold (Appendix Table B-1). However, respondents did indicate on average a greater percent of their business's gross revenue attributable to the sale of bait than non-respondents, suggesting respondents may have more at stake when it comes to the impact of regulations on their business.

Respondents were more likely to have heard of AIS and VHS than non-respondents, but not more likely to say they know something about these issues (Appendix Table B-1). Respondents expressed somewhat more concern about having AIS and fish diseases in the Great Lakes region than did non-respondents. They were no more or less likely to say they were familiar with the USDA-APHIS or state regulations than non-respondents. Non-respondents were more likely to indicate that they handed out information materials or talked one on one with their customers

about what to do with unwanted baitfish or how to prevent the spread of AIS than respondents. However, this unexpected difference was most likely an artifact of the difference in survey method (mail vs. telephone), with the increased social desirability of saying you were taking action when talking to an interviewer on the telephone compared to the mail survey.

### Characteristics of Bait Dealers and Their Businesses in the Great Lakes Region

Most bait dealers were men (Table 2) and the majority had no more than a high school diploma or some type of college or technical school training; less than one-quarter had a college degree. Education levels were a little higher in Wisconsin and a little lower in Indiana. The average age of bait dealers in each state and province was in the 50s.

Almost all respondents reported that their business sells bait to the general public; far fewer sell bait wholesale (Table 3). Bait dealers in Indiana and Michigan were the most likely to engage in the retail sale of bait. Those in Ohio and Ontario were the most likely to sell bait wholesale and collect baitfish from public waters. Very few bait dealers in any state or province raised baitfish. Bait dealers have had a license on average 14 to 19 years. The sale of bait makes up a larger proportion of gross revenue on average for businesses in Ontario and Indiana (almost 40%) than in Michigan (less than 20%).

Almost every bait dealer knew the source of their baitfish (Table 3). Other dealers were the source of baitfish for many respondents in each state or province, especially in Wisconsin and less so in Ontario. Bait dealers in Ontario were much more likely to get their baitfish from public waters than bait dealers in any of the states. Few bait dealers obtained baitfish from private ponds. A number of bait dealers indicated they got baitfish from sources other than those discussed above. We did not inquire what those sources were.

**Table 2.** Socio-demographic characteristics of respondents by state or province.

Socio-demographic Characteristics	Percent					
	Indiana	Michigan	New York	Ohio	Ontario	Wisconsin
Gender*						
Male	75.0	72.1	79.2	79.9	84.8	68.4
Female	25.0	27.9	20.8	20.1	15.2	31.6
Education*						
Less than high school	12.9	3.0	8.9	7.2	13.9	2.6
High school diploma/G.E.D.	36.6	30.7	37.1	38.9	24.6	28.9
Some college or technical school	30.6	37.1	28.7	29.9	44.4	36.9
Associate's degree	12.9	8.9	11.9	7.8	1.6	7.9
College degree	3.5	14.9	9.4	14.4	12.8	23.7
Graduate degree	3.5	5.4	4.0	1.8	2.7	0.0
	Mean					
Age	56.1	53.5	56.8	57.5	55.2	58.0

\*Statistically significant difference between states at P = 0.05 using chi-square test.

**Table 3.** Business characteristics by state or province.

Business Characteristics	Percent					
	Indiana	Michigan	New York	Ohio	Ontario	Wisconsin
Type of Bait Business:						
Sell bait retail*	94.3	96.2	83.5	80.6	88.1	89.7
Sell bait wholesale*	13.8	4.3	17.5	21.8	32.6	7.7
Collect baitfish from public waters*	6.9	8.1	12.1	20.0	39.9	12.8
Raise Baitfish*	5.7	2.4	2.4	8.8	1.6	2.6
Source of Baitfish:						
Other dealers*	65.5	68.2	68.4	59.5	56.2	76.9
Public waters/wild*	6.9	10.4	13.6	28.3	59.4	15.4
Private ponds/farm-raised*	12.6	14.7	15.5	19.7	4.7	10.3
Other sources*	24.1	23.2	18.4	13.9	9.9	10.3
Don't know	1.1	0.9	0.5	1.2	0.0	0.0
Sell "certified" disease free baitfish*						
No	34.9	10.1	12.6	34.0	42.4	24.3
Yes	15.1	76.4	83.4	22.0	19.0	43.3
Don't know	50.0	13.5	4.0	44.0	38.6	32.4
Bait used by anglers fishing in Great Lakes waters*						
No, none	59.3	26.4	43.8	36.0	50.0	54.3
Yes, some	25.9	42.6	23.8	32.0	22.0	25.7
Yes, most or all	2.5	22.4	17.3	25.9	22.5	5.7
Don't know	12.3	8.6	15.1	6.1	5.5	14.3
	Mean					
Years having a bait dealer license	15.5	15.1	14.4	18.1	18.2	19.1
Percent of business's gross revenue attributable to sale of bait	37.8 <sup>b</sup>	17.5 <sup>a</sup>	32.6 <sup>a,b</sup>	28.9 <sup>a</sup>	38.2 <sup>b</sup>	26.9 <sup>a,b</sup>

\*Statistically significant difference between states and provinces at P = 0.05 using chi-square test.

<sup>a,b</sup> Values without a letter in common are significantly different from each other at P = 0.05 using Scheffe's test.

Most bait dealers in New York and Michigan sell "certified" disease-free baitfish, and over 40% sell them in Wisconsin (Table 3). In the other states and provinces, most bait dealers indicated that they do not sell "certified" baitfish or don't know if it is "certified."

The majority of bait dealers in Michigan and Ohio indicated that they thought some of the bait they sold was used by anglers fishing Great Lakes waters (including the five Great Lakes and rivers or streams that run into or connect them) (Table 3). Fewer indicated such use in the other states and provinces.

Most bait dealers sold fathead minnows (Table 4). In Ontario emerald shiners and other species of minnows or shiners besides fatheads and goldens were sold most often. Suckers were sold by

many businesses in Wisconsin and Michigan. Crayfish were sold by over half of the bait dealers in New York.

**Table 4.** Types of bait sold by bait dealers by state or province.

	Percent					
	Indiana	Michigan	New York	Ohio	Ontario	Wisconsin
Type of bait sold						
Fathead Minnows*	73.6	78.2	72.9	58.8	44.0	87.2
Golden Shiners*	28.7	67.8	58.9	32.9	39.4	59.0
Emerald Shiners*	16.1	65.9	49.8	37.1	55.4	23.1
Other species of Minnows or Shiners*	35.6	32.7	17.4	27.1	65.3	46.2
Suckers*	36.8	67.8	38.2	18.8	48.7	74.4
Herring (includes alewife)*	3.4	2.8	9.7	0.6	3.6	0.0
Other fish*	11.5	5.7	3.4	13.5	4.1	10.3
Crayfish*	26.4	4.3	58.9	24.7	1.6	7.7
Frogs	3.4	0.0	2.4	1.2	2.1	0.0
Other bait*	59.8	44.1	35.3	49.4	38.3	46.2
Types of bait sold most often*						
Fathead Minnows	55.9	41.6	29.0	33.8	7.0	50.0
Golden Shiners	1.7	6.0	30.5	2.5	7.7	7.1
Emerald Shiners	3.4	29.8	8.5	28.0	34.6	0.0
Other species of Minnows or Shiners	11.9	5.3	5.0	13.6	37.4	14.3
Suckers	0.0	0.7	1.4	0.0	5.6	10.7
Herring (includes alewife)	0.0	0.7	5.7	0.0	0.0	0.0
Other fish	0.0	0.0	1.4	5.1	1.4	0.0
Crayfish	0.0	0.0	5.0	1.7	0.0	0.0
Frogs	0.0	0.0	0.0	0.0	0.0	0.0
Other bait	27.1	15.9	13.5	15.3	6.3	17.9

\*Statistically significant difference between states and provinces at  $P = 0.05$  using chi-square test.

## Awareness and Knowledge of AIS and Fish Diseases

Most bait dealers, regardless of state / province, had heard of AIS, and many felt they knew something about them (Table 5). Bait dealers in Indiana were the least likely to feel knowledgeable. Indiana bait dealers were also more likely (60%) to have never heard of VHS. In contrast, two-thirds of bait dealers in Michigan and New York said they had heard of VHS and knew something about it.

When asked about their knowledge or opinions about AIS and fish diseases, almost all bait dealers thought AIS could hurt native fish populations or reduce the number of fish available for anglers to catch, and that fish diseases could hurt the species of fish anglers like to fish for (Table 6). Many bait dealers thought AIS could prevent the use of some areas for boating or swimming, and about half thought AIS could damage boats or fishing equipment. Approximately one-quarter of bait dealers overall were unsure about these items. About half of the bait dealers thought the spread of AIS and fish diseases was inevitable, except in Indiana where bait dealers were more likely to indicate they didn't know. Similarly, about two-thirds of bait dealers

thought VHS was a major threat to the health of fish populations in the Great Lakes region, but Indiana bait dealers were more likely to be unsure. About one-third to half of the bait dealers thought fish diseases could harm people; one-quarter to one-third were unsure. Overall, these results varied little by state or province.

**Table 5.** Awareness of aquatic invasive species and VHS by state or province.

	Percent					
	Indiana	Michigan	New York	Ohio	Ontario	Wisconsin
Ever heard of aquatic invasive species?*						
No	13.6	4.0	7.3	7.7	6.7	5.9
Yes, but don't know much	40.7	22.8	27.8	29.7	15.1	23.5
Yes, and know something about them	45.7	73.2	64.9	62.6	78.2	70.6
Ever heard of fish disease called VHS?*						
No	60.5	11.5	16.0	35.1	16.6	14.3
Yes, but don't know much	27.2	21.0	18.6	27.3	24.9	22.9
Yes, and know something about it	12.3	67.5	65.4	37.6	58.5	62.8

\*Statistically significant difference between states and provinces at  $P = 0.05$  using chi-square test.

### Behavioral Responses to the Presence of AIS and Fish Diseases

We asked bait dealers about a variety of actions they could take personally to prevent the spread of AIS and fish diseases, and also actions they could take to educate their customers about how to prevent the spread. Most bait dealers in New York, Michigan, and Wisconsin who were aware of VHS indicated they bought baitfish that had been tested for the disease (Table 7). Bait dealers in Ontario, Ohio, and Indiana were far less likely to have done so. Very few bait dealers who were aware of VHS in any state had baitfish they caught tested for the disease. Even among bait dealers who indicated earlier that they raised or collected their own baitfish very few had them tested (15% overall<sup>1</sup>). However, among bait dealers who were aware of AIS and who collected their own baitfish many, especially in Ontario, indicated they tried to tell if AIS were present in the baitfish they collected before selling them.

Of all the states and provinces, only Ontario bait dealers participated in AIS-HACCP training (Aquatic Invasive Species – Hazard Analysis and Critical Control Point) in substantial numbers (Table 7).

The percentage of bait dealers distributing information to customers varied by state or province (Table 8). Less than half of the Indiana bait dealers communicated information about what to do with unwanted baitfish or how to prevent the spread of AIS with their customers by any of the methods we asked about. Nearly two-thirds of the bait dealers in New York and more than 80% of bait dealers in the other states and provinces communicated information to their customers by at least one method.

<sup>1</sup> Sample sizes were too small for state/province comparisons.



**Table 6.** Bait dealer knowledge regarding aquatic invasive species and fish diseases by state or province.

	Percent					
	Indiana	Michigan	New York	Ohio	Ontario	Wisconsin
<u>Knowledge about aquatic invasive species</u>						
Aquatic invasive species can harm native fish populations						
Agree	83.6	88.8	85.7	84.7	89.9	80.0
Neutral	3.8	5.1	3.7	6.0	6.2	14.3
Disagree	2.5	1.0	0.5	0.7	1.1	0.0
Don't know	10.1	5.1	10.1	8.6	2.8	5.7
Aquatic invasive species can reduce the number of fish available for anglers to catch						
Agree	77.2	85.5	84.4	82.8	86.5	68.6
Neutral	6.3	6.5	3.1	4.6	4.5	14.3
Disagree	3.8	3.0	2.1	2.0	4.5	5.7
Don't know	12.7	5.0	10.4	10.6	4.5	11.4
Aquatic invasive species can prevent use of some areas for boating or swimming						
Agree	54.5	62.0	65.6	58.3	63.7	74.3
Neutral	16.9	17.0	12.0	15.9	17.0	5.7
Disagree	3.9	6.0	3.1	4.6	4.5	5.7
Don't know	24.7	15.0	19.3	21.2	14.8	14.3
Aquatic invasive species can damage boats or fishing equipment						
Agree	48.2	56.8	56.5	50.7	55.7	54.3
Neutral	17.7	19.3	17.3	15.5	21.0	17.1
Disagree	6.3	7.1	6.3	8.1	5.1	8.6
Don't know	27.8	16.8	19.9	25.7	18.2	20.0
The spread of aquatic invasive species is inevitable*						
Agree	35.4	48.0	52.0	46.6	51.8	40.0
Neutral	22.8	18.0	17.2	22.7	19.5	20.0
Disagree	17.7	23.0	12.0	14.0	20.7	31.4
Don't know	24.1	11.0	18.8	16.7	8.0	8.6
<u>Knowledge about fish diseases</u>						
Fish diseases can hurt the species of fish anglers like to fish for						
Agree	83.5	88.9	91.7	90.0	86.2	80.0
Neutral	7.6	7.6	3.1	5.3	7.5	8.6
Disagree	1.3	1.0	1.0	0.7	1.7	2.8
Don't know	7.6	2.5	4.2	3.9	4.6	8.6
VHS is a major threat to the health of fish populations in the Great Lakes Region*						
Agree	44.3	65.0	61.0	59.6	64.2	71.4
Neutral	10.1	12.0	14.2	13.2	14.0	8.6
Disagree	0.0	8.0	7.4	5.3	7.3	5.7
Don't know	45.6	15.0	17.4	21.9	14.5	14.3

**Table 6 (cont.)**

<u>Knowledge about fish diseases</u>	Percent					
	Indiana	Michigan	New York	Ohio	Ontario	Wisconsin
Fish diseases can harm people						
Agree	38.5	40.2	39.5	47.2	39.2	28.6
Neutral	20.5	23.5	20.9	17.8	22.2	22.9
Disagree	5.1	13.3	11.8	10.3	15.8	17.1
Don't know	35.9	23.0	27.8	24.7	22.8	31.4
The spread of fish diseases is inevitable*						
Agree	26.3	48.2	50.2	44.7	45.5	37.2
Neutral	34.2	20.6	19.4	21.1	25.0	25.7
Disagree	18.4	18.6	13.6	15.8	21.0	25.7
Don't know	21.1	12.6	16.8	18.4	8.5	11.4

\*Statistically significant differences between states and provinces at P = 0.05 using chi-square test.

**Table 7.** Actions taken by bait dealers to prevent the spread of aquatic invasive species or fish diseases by state or province.

	Percent					
	Indiana	Michigan	New York	Ohio	Ontario	Wisconsin
For those aware of VHS:						
Buy baitfish that have been tested for the disease*	31.2	80.1	87.3	30.0	18.5	60.0
Have baitfish they caught tested for the disease	6.2	2.3	3.8	1.0	4.0	10.0
For those aware of AIS and who collect their own baitfish:						
Try to tell if AIS are present in with collected baitfish before selling them*	64.3	70.5	68.5	62.9	93.2	ins
For all bait dealers:						
Has business ever participated in training program called AIS-HACCP?*						
No	91.7	95.7	95.3	95.6	41.4	89.4
Yes	2.4	1.9	2.1	4.4	52.1	5.3
Don't know	5.9	2.4	2.6	0.0	6.5	5.3

\*Statistically significant difference between states and provinces at P=0.05 using chi-square test.

<sup>ins</sup> Insufficient sample size.

**Table 8.** Information distributed by bait dealers to inform customers about what to do with unwanted baitfish and how to prevent the spread of AIS, by state or province.

	Percent					
	Indiana	Michigan	New York	Ohio	Ontario	Wisconsin
<u>Methods of communication</u>						
Display signs or posters*	22.0	54.4	18.9	65.4	64.5	67.6
Average # displayed	2.0 <sup>a,b</sup>	1.8 <sup>a</sup>	2.3 <sup>a,b</sup>	2.2 <sup>a,b</sup>	3.0 <sup>b</sup>	2.1 <sup>a,b</sup>
Hand out informational materials*	7.3	40.2	28.1	13.6	27.9	48.6
Average # distributed	20 <sup>a</sup>	65 <sup>a,b</sup>	82 <sup>a,b</sup>	206 <sup>b</sup>	64 <sup>a,b</sup>	61 <sup>a,b</sup>
Talk one on one to customers*	32.9	47.1	51.5	38.9	59.6	27.0
Average # contacted	80 <sup>a</sup>	105 <sup>a</sup>	88 <sup>a</sup>	57 <sup>a</sup>	94 <sup>a</sup>	162 <sup>a</sup>
% using one or more method*	48.8	81.4	64.3	80.9	82.5	83.8
Mean educational action score**	0.6 <sup>a</sup>	1.3 <sup>b,c</sup>	0.9 <sup>a,b</sup>	1.1 <sup>b,c</sup>	1.4 <sup>c</sup>	1.4 <sup>c</sup>
For those who communicate:						
Type of information communicated						
What to do with unwanted baitfish*	41.1	62.2	51.1	51.3	81.5	60.0
How to clean fishing equipment to remove AIS*	6.8	25.0	23.9	19.9	34.4	40.0
How to clean boats and boating equipment to remove AIS*	15.1	35.7	30.4	26.3	43.7	60.0
Recall source of information*						
No	56.8	35.1	38.2	37.7	25.0	14.8
Yes	43.2	64.9	61.8	62.3	75.0	85.2

\*Statistically significant difference between states and provinces at P = 0.05 using chi-square test.

<sup>a,b</sup> Values without a letter in common are significantly different from each other at P=0.05 using Scheffe's test.

\*\* Score was a sum of the number of different methods bait dealers used to communicate with their customers about what to do with unwanted baitfish or how to prevent the spread of AIS. The scale ranged from 0 to 3.

The methods used to distribute information varied widely by state or province (Table 8). No more than one-third of the bait dealers in Indiana used any of the methods. About half of the New York bait dealers talked one on one with their customers, but few displayed signs or handed out materials. Ohio bait dealers were more likely to display signs than hand out materials or talk to their customers. Two-thirds of Ontario bait dealers talked to their customers and displayed signs; few handed out materials. Two-thirds of bait dealers in Wisconsin displayed signs and about half handed out materials, but few talked directly with their customers.

We created an educational action score that summed the number of different methods bait dealers used to communicate with their customers about what to do with unwanted baitfish or how to prevent the spread of AIS. The scale ranged from 0 (no methods used) to 3 (all three methods we asked about were used). Thirty-one percent of bait dealers did not communicate by any of the methods and 12% used all three methods. The average number of methods used was 1.1, and this quantity varied significantly by state or province (Table 8). Indiana bait dealers had the lowest score. Ontario and Wisconsin bait dealers used more methods on average than bait dealers in the other states. Bait dealers who knew something about VHS (1.5) had a higher educational action score than those who just heard about it (0.9), who in turn had a higher score

than those who had never heard of the disease (0.6). Similarly, those who knew something about AIS (1.3) had a higher score than those who were just aware of AIS (0.9), which was higher than those who were not aware (0.5).

The information most often communicated with customers, especially by bait dealers in Ontario, was what to do with unwanted baitfish (Table 8). Information about how to clean boating or fishing equipment was less likely to be communicated.

Many bait dealers recalled the source of the information that they communicated (Table 8). The most frequently mentioned source in all the states and provinces was the state/provincial fishery management agency. For a list of commonly mentioned sources by state or province see Appendix Table B-2.

### Level of Concern Regarding AIS and Fish Diseases

Almost all bait dealers in every state and province were at least slightly concerned about having AIS and fish diseases in the Great Lakes region (Table 9). Many were very concerned, more so about AIS than fish diseases. Bait dealers in Indiana and New York were a little less concerned on average than bait dealers in the other states and provinces. Wisconsin bait dealers were even less concerned, with about one-third not at all or slightly concerned.

**Table 9.** Bait dealer level of concern about aquatic invasive species and fish diseases in the Great Lakes region by state or province.

	Percent					
	Indiana	Michigan	New York	Ohio	Ontario	Wisconsin
Concern about aquatic invasive species*						
Not at all concerned	3.6	2.4	1.0	1.9	0.5	7.9
Slightly concerned	17.9	4.3	10.8	6.8	8.7	18.4
Moderately concerned	25.0	27.5	35.1	22.8	24.9	13.2
Very concerned	53.5	65.8	53.1	68.5	65.9	60.5
Concern about fish diseases*						
Not at all concerned	3.6	2.4	2.1	1.2	2.8	10.5
Slightly concerned	18.1	9.1	12.8	10.6	9.4	18.4
Moderately concerned	31.3	30.8	33.8	31.3	21.7	21.1
Very concerned	47.0	57.7	51.3	56.9	66.1	50.0

\*Statistically significant difference between states and provinces at P = 0.05 using chi-square test.

### Familiarity with Regulations

Familiarity with the USDA-APHIS regulations regarding the movement of live bait into the U.S. and between states was greatest in New York and Ohio, with almost half of the bait dealers indicating they were moderately or very familiar with the regulations (Table 10). Bait dealers in Michigan and Wisconsin were generally less familiar, and over half of the bait dealers in Indiana were not at all familiar.

Many bait dealers in New York and Ontario indicated they were very familiar with the state and provincial regulations regarding the sale and transport of baitfish (Table 10). Bait dealers in Michigan, Ohio, and Wisconsin were less likely to be very familiar and more likely to be moderately or slightly familiar. Almost half of the bait dealers in Indiana were not at all familiar with their state's regulations. Those who were very (1.4) or moderately (1.3) familiar had a higher educational action score than those who were slightly familiar (0.9).

**Table 10.** Familiarity with USDA and state/province regulations regarding the sale and transport of baitfish by state or province.

	Percent					
	Indiana	Michigan	New York	Ohio	Ontario	Wisconsin
USDA-APHIS regulations regarding the movement of live bait into the U.S. and between states*						
Not at all familiar	58.8	37.8	27.8	27.9	N/A	39.5
Slightly familiar	28.2	30.1	25.3	27.9	N/A	23.7
Moderately familiar	10.6	24.9	24.2	25.4	N/A	18.4
Very familiar	2.4	7.2	22.7	18.8	N/A	18.4
State/province regulations about the sale and transport of baitfish*						
Not at all familiar	44.1	10.0	6.6	17.1	2.7	13.2
Slightly familiar	25.0	19.1	9.2	21.3	7.5	23.7
Moderately familiar	19.0	38.4	20.4	26.8	32.8	28.9
Very familiar	11.9	32.5	63.8	34.8	57.0	34.2

\*Statistically significant difference between states and provinces at P = 0.05 using chi-square test.

## Sources of Information about Regulations

The most frequently mentioned source of information about regulations intended to prevent the spread of fish diseases and AIS was the state or provincial fish and wildlife agency (Table 11). Other bait dealers were mentioned by one-quarter to one-half as a source of information. Other sources, such as USDA-APHIS and Sea Grant, were mentioned infrequently. Twenty-eight percent of Wisconsin bait dealers identified a government agency other than the DNR as a source, most likely the AIS coordinators associated with Cooperative Extension in each county.

The trustworthiness of the state/provincial fish and wildlife agency did not vary by state or province and was rated quite high (Table 12), with two-thirds to three-quarters believing their state/provincial agency was very trustworthy. The trustworthiness of other sources could not be analyzed by state because of small sample sizes, but overall trustworthiness of these sources was not rated quite as high as the agency except for Sea Grant, which had the same proportion rating it as very trustworthy as state/provincial fish and wildlife agencies.

**Table 11.** Sources used by bait dealers for information about regulations intended to prevent the spread of fish diseases and aquatic invasive species, by state or province.

Information sources	Percent					
	Indiana	Michigan	New York	Ohio	Ontario	Wisconsin
My state/province's fish and wildlife agency*	53.1	80.6	76.8	89.5	95.2	86.1
Other bait dealers*	35.8	46.1	44.3	32.7	26.5	33.3
USDA-APHIS	16.0	14.7	12.4	20.9	N/A	8.3
Other government agencies*	18.5	9.9	10.8	14.4	12.2	27.8
Sea Grant*	12.3	13.1	6.2	18.3	N/A	16.7
Educational institutions (e.g., Universities)*	14.8	6.8	11.9	15.7	6.3	16.7
Other sources	9.9	8.9	6.7	10.5	11.1	8.3

\*Statistically significant difference between states and provinces at  $P = 0.05$  using chi-square test.

Across the board almost all bait dealers preferred to get information about new regulations through a direct mailing from their state or provincial fish and wildlife agency (Table 13). Some bait dealers in Ohio, Ontario, and New York were interested in getting new information as part of their bait dealer's license form. This was true for fewer bait dealers in Michigan, Indiana, and Wisconsin. Other methods of information dissemination were preferred by very few bait dealers. Bait dealers could write in suggestions of methods other than those we listed, and a number of bait dealers wrote in their personal email address. This suggests that email might be the preferred method of direct contact rather than postal mail. We did not ask about email contact because currently an email address is not required on most bait dealer license applications, but it might be something to consider for the future.

### Opinions about Regulations

Bait dealers provided their views about regulations, including impact on their businesses, the process used to make the regulations, etc. Bait dealer views differed by state or province for most of these questions. For example, about three-quarters of New York and Wisconsin bait dealers think the cost of baitfish has gone up as a direct result of the regulations; fewer Michigan, Ohio, and Ontario bait dealers thought this was the case, and Indiana bait dealers were most likely to be unsure (Table 14).

**Table 12.** Trustworthiness of information sources according to bait dealers, overall and by state or province.<sup>a</sup>

Information sources	Percent						
	Overall	Indiana	Michigan	New York	Ohio	Ontario	Wisconsin
My state/province's fish and wildlife agency							
Not at all trustworthy	5.8	11.9	4.2	2.3	1.6	4.7	ins
Somewhat trustworthy	24.6	28.6	26.8	27.8	22.1	25.3	ins
Very trustworthy	69.6	59.5	69.0	69.9	76.3	70.0	ins
Other bait dealers							
Not at all trustworthy	7.9						
Somewhat trustworthy	39.0						
Very trustworthy	53.1						
USDA-APHIS							
Not at all trustworthy	16.2						
Somewhat trustworthy	27.5						
Very trustworthy	56.3						
Other government agencies							
Not at all trustworthy	22.3						
Somewhat trustworthy	34.5						
Very trustworthy	43.2						
Sea Grant							
Not at all trustworthy	12.1						
Somewhat trustworthy	20.5						
Very trustworthy	67.4						
Educational institutions							
Not at all trustworthy	16.2						
Somewhat trustworthy	39.9						
Very trustworthy	43.9						

<sup>a</sup>Analysis by state or province could not be done for most sources because of insufficient sample size by state or province.

<sup>ins</sup> Insufficient sample size

**Table 13.** Best ways according to bait dealers to reach them with information about new regulations by state or province.

Best ways to reach bait dealers	Percent					
	Indiana	Michigan	New York	Ohio	Ontario	Wisconsin
Direct mailing from my state or province's fish and wildlife agency	87.8	87.4	84.0	87.6	91.5	91.7
As part of my bait dealer license form*	30.5	34.6	43.3	47.1	43.9	33.3
Web site of my state or province's fish and wildlife agency*	7.3	6.8	16.5	11.1	14.8	19.4
Conference or workshop	4.9	3.1	4.1	5.9	8.5	2.8
Web site of USDA-APHIS	4.9	1.0	5.2	6.5	N/A	5.6
iPhone/Smart phone apps	4.9	5.2	1.5	2.6	5.3	2.8
Other way	8.7	4.7	7.2	7.2	9.0	11.1

\*Statistically significant difference between states and provinces at P = 0.05 using chi-square test.

In most states and provinces a plurality of bait dealers did not think they were asked for their opinions or that their opinions were seriously considered before the current regulations were put in place (Table 14). New York bait dealers were the most likely of all the states and provinces to believe that their opinions were not seriously considered and that the regulations unfairly burden baitfish dealers. However, bait dealers who believed they had not been included in the process of developing regulations and/or that the regulations placed an unfair burden on bait dealers were just as likely to try to follow the regulations as other bait dealers.

Bait dealers in Michigan, Ohio, Ontario, and Wisconsin were largely evenly divided between agreement, disagreement, and neutrality when asked if the regulations are effective at preventing the spread of fish diseases (Table 14). Bait dealers in New York were more likely to agree that the regulations are not effective at preventing the spread of fish diseases.

Half to three-quarters of bait dealers were neutral or unsure if their state/province's or USDA-APHIS regulations were too complex (Table 14). This was particularly true for the USDA-APHIS regulations. Among bait dealers with an opinion more tended to think the regulations were too complex than not.

Bait dealers in New York were the most likely to believe that the regulations had negatively affected their baitfish sales (Table 14). They, along with Wisconsin bait dealers, had the highest percentages believing the regulations were unnecessary. The majority of bait dealers in Michigan, Ohio, and Ontario thought the regulations were necessary. Once again Indiana bait dealers were more likely to be unsure compared to the other states and provinces.



**Table 14.** Bait dealer opinions about regulations, by state or province.

	Percent					
	Indiana	Michigan	New York	Ohio	Ontario	Wisconsin
The cost of baitfish has gone up as a direct result of the regulations*						
Agree	29.7	51.9	77.6	46.3	46.5	72.2
Neutral	25.9	29.1	11.2	19.7	31.6	5.6
Disagree	4.9	6.3	4.3	13.6	11.2	8.3
Don't know	39.5	12.7	6.9	20.4	10.7	13.9
The cost of baitfish has nothing to do with the regulations*						
Agree	10.1	14.9	15.1	20.4	29.0	17.6
Neutral	21.5	28.2	11.9	23.8	25.1	14.7
Disagree	27.8	43.1	62.7	32.0	35.5	55.9
Don't know	40.6	13.8	10.3	23.8	10.4	11.8
Bait dealers weren't asked for their opinions before current regulations were put in place						
Agree	42.0	53.4	61.8	49.3	55.6	50.0
Neutral	28.4	24.6	17.2	23.0	24.3	17.6
Disagree	3.7	2.7	3.8	6.1	4.8	0.0
Don't know	25.9	19.3	17.2	21.6	15.3	32.4
I don't think opinions of bait dealers were seriously considered before current regulations were put in place*						
Agree	42.0	48.7	62.2	35.4	49.5	51.4
Neutral	25.9	28.3	17.6	26.5	30.3	22.9
Disagree	2.5	4.8	5.3	10.9	10.6	11.4
Don't know	29.6	18.2	14.9	27.2	9.6	14.3
The regulations are not effective at preventing the spread of fish diseases*						
Agree	14.8	32.3	38.0	23.6	36.1	24.2
Neutral	25.9	32.3	25.0	28.5	25.6	27.3
Disagree	18.5	22.0	19.6	28.5	31.1	30.3
Don't know	40.8	13.4	17.4	19.4	7.2	18.2
I think the regulations unfairly burden baitfish dealers*						
Agree	18.3	26.6	40.0	21.2	28.3	28.9
Neutral	35.4	32.8	25.0	23.1	30.9	26.3
Disagree	14.6	31.9	27.0	30.7	36.6	36.9
Don't know	31.7	8.7	8.0	25.0	4.2	7.9
My state/province's regulations are too complex*						
Agree	13.8	30.4	35.7	19.7	32.4	27.8
Neutral	35.0	40.8	29.1	38.1	42.9	27.8
Disagree	13.8	15.8	20.9	22.5	19.2	16.6
Don't know	37.4	13.0	14.3	19.7	5.5	27.8

**Table 14** (cont.)

	Percent					
	Indiana	Michigan	New York	Ohio	Ontario	Wisconsin
USDA-APHIS regulations are too complex						
Agree	15.4	27.9	30.0	21.5	N/A	19.4
Neutral	38.5	35.5	32.2	35.4	N/A	33.4
Disagree	6.4	10.4	11.1	12.5	N/A	8.3
Don't know	39.7	26.2	26.7	30.6	N/A	38.9
I sell fewer baitfish because of the regulations*						
Agree	6.2	21.5	45.2	15.3	29.5	28.6
Neutral	25.0	28.0	19.4	25.0	30.6	17.1
Disagree	38.8	38.7	27.4	44.4	33.9	42.9
Don't know	30.0	11.8	8.0	15.3	6.0	11.4
The regulations are unnecessary*						
Agree	12.6	16.8	20.8	13.1	16.5	27.8
Neutral	26.6	23.9	29.5	22.8	20.9	16.7
Disagree	34.2	50.6	38.2	51.0	59.9	44.4
Don't know	26.6	8.7	11.5	13.1	2.7	11.1

\*Statistically significant difference between states and provinces at  $P = 0.05$  using chi-square test.

### Compliance with Regulations

Most bait dealers, regardless of state/province, thought it was important to follow the regulations of USDA-APHIS and their state/province regarding transport and sale of baitfish (Table 15). Ontario bait dealers were the most likely to say it was very important and Wisconsin bait dealers the least likely.

Bait dealers were also asked if they were trying to follow the USDA-APHIS and their state/provinces regulations. Over half of the Indiana bait dealers and almost one-half of the Wisconsin bait dealers did not think the USDA-APHIS regulations applied to them (Table 15). The proportion was lower in the other states, but still fairly common. Similarly, more bait dealers in Indiana and Wisconsin than in other states or provinces did not think their state/provincial regulations applied to them. Among those who felt the USDA-APHIS regulations applied to them, most indicated they were trying to follow the regulations all of the time. Similarly, among those who thought the state/provincial regulations applied, almost all said they tried to follow them all of the time.

Bait dealers were asked if they agreed with a number of belief statements that could influence regulatory compliance. We have divided these statements into three types: behavioral beliefs, normative beliefs, and control beliefs. We discuss each below and identify relationships between them and bait dealers' intentions to follow the regulations and their efforts to educate their customers (using our educational action score).

**Table 15.** Importance of following and trying to follow the USDA-APHIS and state/province regulations regarding transport and sale of baitfish by state or province.

	Percent					
	Indiana	Michigan	New York	Ohio	Ontario	Wisconsin
Importance of following USDA-APHIS and state/province regulations*						
Not at all important	1.3	0.5	3.3	4.1	1.1	6.2
Slightly important	7.7	9.2	6.0	6.8	3.8	9.4
Moderately important	19.2	18.9	13.7	19.2	11.9	25.0
Very important	71.8	71.4	77.0	69.9	83.2	59.4
Trying to follow USDA-APHIS regulations*						
Some of the time	3.7	5.5	2.1	3.8	N/A	0.0
Most of the time	8.5	9.0	7.3	8.8	N/A	8.2
All of the time	30.5	50.3	65.1	53.7	N/A	45.9
Not applicable	57.3	35.2	25.5	33.7	N/A	45.9
Trying to follow state/province regulations*						
Some of the time	2.4	1.4	0.5	1.2	0.0	0.0
Most of the time	6.1	6.3	3.1	10.5	6.5	10.8
All of the time	67.1	84.1	90.2	71.6	89.2	62.2
Not applicable	24.4	8.2	6.2	16.7	4.3	27.0

\*Statistically significant difference between states and provinces at  $P = 0.05$  using chi-square test.

First, most bait dealers in all states and provinces agreed with three behavioral belief statements indicating that they (1) wanted to do all they could to prevent the spread of fish diseases, (2) believed that the spread was bad for their business, and (3) thought that regulations were needed to prevent the spread (Table 16). Agreement with these statements did not differ by state/province. All three statements were positively correlated with bait dealers' intentions to follow the regulations of their state or province (Table 17). About two-thirds of the bait dealers felt that following the regulations would help limit the spread of fish diseases, and this belief also was positively correlated with their intentions to follow the regulations.

Less than 20% of bait dealers in U.S. states think USDA-APHIS does not know enough about fish diseases and how they are spread (Table 16). For bait dealers in Ontario the referent was the Ontario Ministry of Natural Resources: 28% believe the Ministry does not know enough; over 40% disagreed. This statement was negatively correlated with bait dealers' intentions to follow the regulations, suggesting that those who think USDA-APHIS or the Ministry do not know enough are less likely to follow the regulations (Table 17).

Almost 60% or more of bait dealers in each state, except Indiana and Ohio, thought that most bait dealers followed the regulations (Table 16). A majority of bait dealers, and even more in Ontario, also thought that most bait dealers felt it was important for bait dealers to follow the regulations. Bait dealers in Indiana and Ohio were more likely to be unsure about these statements. These normative beliefs were positively correlated with trying to follow one's state or provincial regulations (Table 17). Forty-five to sixty percent of bait dealers also trusted the opinions of other bait dealers about the importance of following the regulations. However, this

**Table 16.** Behavioral and normative beliefs associated with following the regulations regarding the sale and transport of baitfish.

Behavioral beliefs	Percent					
	Indiana	Michigan	New York	Ohio	Ontario	Wisconsin
I want to do all I can to prevent the spread of fish diseases						
Agree	83.3	86.5	91.6	86.7	93.2	85.3
Neutral	14.1	11.5	5.8	11.3	5.1	8.8
Disagree	1.3	1.0	1.0	0.7	0.0	0.0
Don't know	1.3	1.0	1.6	1.3	1.7	5.9
The spread of fish diseases is bad for my business						
Agree	82.2	83.5	84.9	88.7	91.6	71.4
Neutral	12.7	9.5	10.9	5.3	3.9	14.3
Disagree	1.3	4.0	1.1	1.3	1.7	5.7
Don't know	3.8	3.0	3.1	4.7	2.8	8.6
Regulations about the transport of baitfish are needed to keep fish diseases from spreading						
Agree	81.4	76.2	73.9	80.4	83.6	73.6
Neutral	9.9	13.8	11.2	6.1	7.4	8.8
Disagree	2.5	7.9	11.2	8.1	7.4	8.8
Don't know	6.2	2.1	3.7	5.4	1.6	8.8
If I follow the regulations, that will help limit the spread of fish diseases*						
Agree	61.0	73.6	69.1	75.1	76.5	71.8
Neutral	22.0	12.7	13.4	10.6	9.9	15.4
Disagree	3.7	7.8	7.5	6.2	11.5	7.7
Don't know	13.3	5.9	10.0	8.1	2.1	5.1
I don't think USDA-APHIS/Ontario Ministry of Natural Resources know enough about fish diseases and how they are spread						
Agree	14.9	16.3	16.7	15.5	27.5	16.2
Neutral	33.3	34.4	33.8	28.0	24.3	40.5
Disagree	22.2	28.6	31.8	30.4	43.9	32.5
Don't know	29.6	20.7	17.7	26.1	4.2	10.8

**Table 16 (cont.)**

Normative beliefs	Percent					
	Indiana	Michigan	New York	Ohio	Ontario	Wisconsin
Most bait dealers follow the regulations*						
Agree	46.9	58.1	69.7	50.3	71.4	65.8
Neutral	16.0	20.5	12.4	19.7	10.4	23.7
Disagree	3.7	6.8	4.5	6.4	7.3	0.0
Don't know	33.4	14.6	13.4	23.6	10.9	10.5
Most bait dealers think it is important for us to follow the regulations*						
Agree	50.6	61.5	60.8	55.9	75.1	61.1
Neutral	22.9	18.5	17.4	19.3	14.5	19.4
Disagree	3.6	9.3	11.4	6.8	5.7	2.8
Don't know	22.9	10.7	10.4	18.0	4.7	16.7
I trust my state/provincial natural resource agency when it comes to the importance of following the regulations						
Agree	72.4	67.9	65.0	76.4	72.2	73.7
Neutral	12.0	18.5	20.5	11.8	15.7	13.2
Disagree	4.8	10.7	8.5	7.5	10.5	10.5
Don't know	10.8	2.9	6.0	4.3	1.6	2.6
I trust the opinions of other bait dealers about the importance of following the regulations*						
Agree	46.3	50.3	56.9	46.9	59.0	59.0
Neutral	28.0	34.8	27.1	28.1	30.6	20.5
Disagree	3.7	7.7	7.0	6.9	5.2	12.8
Don't know	22.0	7.2	9.0	18.1	5.2	7.7

\*Statistically significant differences between states and provinces at P = 0.05 using chi-square test.

trust was not correlated with trying to follow the regulations. Similarly, many bait dealers indicated that they trusted their state or provincial natural resource agency when it comes to the importance of following the regulations, but this was not correlated with their intention to follow the regulations.

The majority of bait dealers, except in Indiana, thought it was easy for them to follow the regulations and many felt they had a good understanding of the issues related to AIS (Table 18). Once again bait dealers in Indiana were more likely to be unsure, and 40% agreed that they don't know enough about the regulations to follow them. Bait dealers in Ontario and New York were most likely to believe they knew enough about the regulations to follow them. Fewer bait dealers in the other states felt this way. All of these statements were significantly correlated with trying to follow the state/provincial regulations and--where applicable--the USDA-APHIS regulations (Table 17). Additionally, bait dealers who strongly agreed that they had a good understanding of the issues related to AIS had a higher educational action score (1.6) than those who disagreed (0.8) or strongly disagreed (0.3). Furthermore, bait dealers who strongly agreed

that they did not know enough about the regulations to follow them (0.6) had a lower score than those who were neutral (1.1), who in turn had a lower score than those who strongly disagreed (1.6).

**Table 17.** Correlation of behavioral, normative, and control beliefs with trying to follow state/provincial and USDA-APHIS regulations.

	Correlation	
	Trying to follow state/provincial regulations	Trying to follow USDA-APHIS regulations
<u>Behavioral Beliefs</u>		
I want to do all I can to prevent the spread of fish diseases	.151**	.136*
The spread of fish diseases is bad for my business	.125*	.063
Regulations about the transport of baitfish are needed to keep fish diseases from spreading	.109*	.030
If I follow the regulations, that will help limit the spread of fish diseases	.110*	.074
I don't think USDA-APHIS/Ontario Ministry of Natural Resources knows enough about fish diseases and how they are spread	-.095*	-.058
<u>Normative beliefs</u>		
Most bait dealers follow the regulations	.137*	.019
Most bait dealers think it is important for us to follow the regulations	.127*	.077
I trust my state/provincial natural resource agency when it comes to the importance of following the regulations	.057	.051
I trust the opinions of other bait dealers about the importance of following the regulations	.056	.011
<u>Control beliefs</u>		
It is easy for me to follow the regulations	.121*	.167*
I have a good understanding of issues related to aquatic invasive species	.100*	.116*
I don't know enough about the regulations to follow them	-.126*	-.200**
It costs too much to follow the regulations	-.043	-.061
It takes too much time to follow the regulations	-.082*	-.082
I don't have the equipment or facilities to follow all the regulations	-.179**	-.137*
I have a hard time complying with my state's/province's regulations	-.086*	-.083
I have a hard time complying with USDA-APHIS regulations	-.128*	-.067

\*Statistically significant correlation at  $p < 0.05$ .

\*\*Statistically significant correlation at  $p < 0.001$ .

**Table 18.** Control beliefs associated with following the regulations regarding the sale and transport of baitfish.

Control beliefs	Percent					
	IN	MI	NY	OH	ON	WI
It is easy for me to follow the regulations*						
Agree	43.9	60.9	70.3	64.9	73.7	57.9
Neutral	23.2	20.3	12.6	15.8	12.1	23.7
Disagree	7.3	14.0	12.1	4.8	13.7	10.5
Don't know	25.6	4.8	5.0	14.5	0.5	7.9
I have a good understanding of issues related to aquatic invasive species*						
Agree	32.9	56.5	59.4	47.7	64.8	57.2
Neutral	32.9	27.3	21.9	31.5	23.5	31.4
Disagree	12.7	8.1	6.2	10.1	5.0	5.7
Don't know	21.5	8.1	12.5	10.7	6.7	5.7
I don't know enough about the regulations to follow them*						
Agree	40.3	13.2	10.7	20.6	6.5	21.6
Neutral	34.1	31.4	22.4	31.2	20.5	27.0
Disagree	17.1	48.5	60.8	37.6	71.4	43.3
Don't know	8.5	6.9	6.1	10.6	1.6	8.1
It costs too much to follow the regulations*						
Agree	11.2	16.1	25.0	16.4	14.4	18.4
Neutral	30.0	35.6	28.1	31.4	35.9	31.6
Disagree	28.8	37.6	40.3	34.0	48.1	42.1
Don't know	30.0	10.7	6.6	18.2	1.6	7.9
It takes too much time to follow the regulations*						
Agree	8.6	15.0	15.7	12.3	21.1	13.5
Neutral	34.6	33.0	30.3	27.2	30.5	37.8
Disagree	32.1	45.7	47.4	42.6	46.8	40.6
Don't know	24.7	6.3	6.6	17.9	1.6	8.1
I don't have the equipment or facilities to follow all the regulations*						
Agree	12.3	6.8	9.6	15.6	7.9	10.5
Neutral	27.2	33.7	26.4	29.4	24.7	34.2
Disagree	25.9	49.3	54.9	34.4	65.3	34.2
Don't know	34.6	10.2	9.1	20.6	2.1	21.1
I have a hard time complying with my state's/province's regulations*						
Agree	3.7	5.3	7.6	5.1	9.6	15.4
Neutral	35.3	28.5	24.2	28.0	21.8	23.1
Disagree	42.7	60.4	61.1	58.6	67.5	48.7
Don't know	18.3	5.8	7.1	8.3	1.1	12.8
I have a hard time complying with USDA-APHIS regulations*						
Agree	6.1	4.0	5.6	5.7	N/A	10.8
Neutral	34.1	36.0	29.7	32.7	N/A	32.4
Disagree	24.4	46.0	53.4	45.2	N/A	35.2
Don't know	35.4	14.0	11.3	16.4	N/A	21.6

\*Statistically significant differences between states and provinces at P = 0.05 using chi-square test.

Having the necessary equipment or facilities does not seem to be preventing bait dealers from following the regulations, nor does cost or time (Table 18). However, a few more bait dealers thought cost or time was a barrier to following the regulations compared with having the necessary equipment or facilities, but the percentage never exceeded 25%. These control beliefs were correlated with trying to follow the regulations, suggesting that those who didn't have the time, money, and particularly the equipment or facilities were less likely to try to follow the regulations all of the time (Table 17). Additionally, those who strongly agreed (0.9) or agreed (0.9) that they didn't have the equipment or facilities to follow all the regulations had a lower educational action score than those who strongly disagreed (1.5).

Most bait dealers said they did not have a hard time complying with their state/provincial or (where applicable) USDA-APHIS regulations (Table 18). The proportion differed by state or province with those in Michigan, New York, Ohio, and Ontario more likely to say they did not have a hard time complying than those in Indiana or Wisconsin.

## **CONCLUSIONS AND RECOMMENDATIONS**

In this section of the report we will highlight what we consider to be the most significant results in the areas of bait dealer awareness of fish diseases and AIS, actions being taken to prevent the spread, and factors influencing compliance with the regulations. We will also make some recommendations for future outreach efforts and additional information needs.

### **Bait Dealers' Awareness of Fish Diseases and AIS**

Most respondents were aware of VHS and AIS and generally knowledgeable about AIS and fish diseases. They were concerned about AIS and VHS in the Great Lakes region, with two-thirds believing that VHS is a major threat to the health of fish populations in the region. Most were familiar with their state or provincial regulations. They felt it was important to follow the regulations and were trying to follow them. Fewer were familiar with the USDA-APHIS regulations and a sizable and variable proportion (26-57% depending on the state) thought those regulations did not apply to them. We found that bait dealers who were aware of VHS, AIS and the regulations were more likely to be trying to follow the regulations and used a variety of methods to inform their customers about what to do with unwanted baitfish and how to prevent the spread of AIS. These results suggest that little additional effort is needed to inform bait dealers about AIS and fish diseases generally, except perhaps in Indiana where bait dealers were less likely to be aware and less certain in their knowledge. However, bait dealers might benefit from more information about the specifics of the regulations, especially USDA-APHIS regulations.

### **Actions to Prevent the Spread of Fish Diseases and AIS**

Bait dealers are taking a variety of actions within their businesses to prevent the spread of fish diseases and AIS. We discovered a great deal of inter-state/province variation in these efforts. For example, selling "certified" bait is a very common action in Michigan and New York, but



uncommon in the other states and provinces. Ontario bait dealers are much more likely than bait dealers in other states to try to tell if AIS are present in the baitfish they collect before selling them.

Almost all bait dealers preferred to get information about new regulations through a direct mailing from their state or provincial fish and wildlife agency. However, a number of bait dealers wrote in their personal email address when asked how they would like to be contacted. This finding suggests that email might be the preferred method of direct contact rather than postal mail.

Over 80% of bait dealers in Michigan, Ohio, Ontario, and Wisconsin communicated by at least one method with their customers about what to do with unwanted baitfish and how to prevent the spread of AIS. Bait dealers in Ontario and Wisconsin used more methods on average than bait dealers in other states. This suggests that anglers frequenting these businesses had more opportunities for exposure to the messages. For example, a recent study of baitfish anglers in New York found that over half of them got information about baitfish regulations from dealers (Connelly and Knuth, 2014). Bait dealers were more likely to communicate messages about baitfish than about AIS. Most bait dealers sell baitfish; therefore the emphasis on messages about what to do with unwanted baitfish seems appropriate. However, many businesses are also engaged in other activities, such as selling fishing equipment and marina operations. Consequently, providing bait dealers with more educational materials about preventing the spread of AIS might provide an additional opportunity for communicating those messages with anglers.

### **Factors Influencing Compliance with State/Provincial Regulations**

Bait dealers who indicated that they wanted to do all they could to prevent the spread of fish diseases, which comprised most bait dealers, were more likely to try to follow the state/provincial regulations regarding the sale and transport of baitfish. They were also more likely to try to follow the state/provincial regulations regarding the sale and transport of baitfish if they believed:

- The spread of fish diseases is bad for my business.
- Regulations about the transport of baitfish are needed to keep fish diseases from spreading.
- If I follow the regulations, that will help limit the spread of fish diseases.

Future communication with bait dealers that emphasize/reiterate these beliefs or attempts to increase agreement with these statements will likely be the most fruitful in increasing compliance with the regulations. For example, pointing out in messages how the spread of fish diseases can negatively impact bait businesses could lead to increased compliance. It is also important to keep in mind in any communication efforts with bait dealers that less than one-quarter have a college degree.

The following statements were also positively correlated with trying to follow the state/provincial regulations regarding the sale and transport of baitfish:

- Most bait dealers follow the regulations.
- Most bait dealers think it is important for us to follow the regulations.

Similarly, future communication with bait dealers that emphasizes the social norm of following the regulations will likely be the most fruitful in increasing compliance with the regulations.

Finally, the following statements were also positively correlated with trying to follow the state/provincial regulations regarding the sale and transport of baitfish:

- It is easy for me to follow the regulations.
- I have a good understanding of the issues related to AIS.

In this case, efforts to educate bait dealers further regarding the issues related to AIS will likely help with compliance, as will any actions that make compliance easier, such as reducing paperwork, simplifying the rules, etc.

### **Additional Information Needs**

Some states and provinces may be considering modifying the current regulations regarding the sale and transport of baitfish. This would be an excellent opportunity to gather information from bait dealers on what changes they would like to see. We found that bait dealers in different states had different levels of awareness and varied a great deal in the types of actions they took. These differences may relate to variation in regulations or messages across states/provinces. In the context of potential regulations changes, bait dealers could be asked what is working for them and what changes they would like to see. This would also involve bait dealers in the process, and address concerns expressed in this survey that their opinions were not asked for or considered.

We found that many bait dealers were communicating with their customers about what to do with unwanted baitfish and how to prevent the spread of AIS. As a key communication channel to anglers, would bait dealers be willing to do more, and if so, how could managers and educators best support them? A recent study of bait dealers in Wisconsin (presented by Wakeman, 2014) partially addressed this question and found that bait dealers who felt they knew more about AIS and those supported by personal contact with local AIS experts were more willing to educate their customers. Would these findings be similar in other states and provinces?

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APPENDIX A: MAIL QUESTIONNAIRE

# A SURVEY OF BAIT DEALERS IN THE GREAT LAKES REGION



Cornell University  
Human Dimensions Research Unit

# **A SURVEY OF BAIT DEALERS IN THE GREAT LAKES REGION**

Research funded by the  
Great Lakes Fishery Commission

Research conducted by the  
Human Dimensions Research Unit  
Department of Natural Resources  
Cornell University

Cornell University is conducting this survey, funded by the Great Lakes Fishery Commission, to learn about the concerns bait dealers may have regarding fish diseases and aquatic invasive species. We also want to know about the impacts of USDA-APHIS and state regulations on your bait business. The Commission, state agencies, and other organizations will use the results of this survey to better understand the concerns of bait dealers, how best to reach them with new information about fish diseases and aquatic invasive species, and how best to respond to new species and diseases.

Your business was selected from the list of licensed bait dealers in your state. Your participation in this survey is voluntary, but we sincerely hope you will take just a few minutes to answer our questions. We do not seek any financial information from you. Your identity will be kept confidential and the information you give us will never be associated with your name.

Please complete this questionnaire as soon as you can, seal it with the white re-sealable label provided, and drop it in any mailbox; return postage has been paid.

**THANK YOU FOR YOUR HELP!**

1. How many years has your business had a bait dealer license?

\_\_\_\_\_ years

2. What type of bait business do you operate? *(Check all that apply.)*

- ☐ Sell bait wholesale
- ☐ Sell bait retail
- ☐ Raise baitfish
- ☐ Collect baitfish from public waters

3a. Which of the following types of bait do you sell? *(Check all that apply.)*

- ☐ Emerald Shiners
- ☐ Golden Shiners
- ☐ Fathead Minnows
- ☐ Other species of Minnows or Shiners
- ☐ Herring (includes alewife)
- ☐ Suckers
- ☐ Other fish
- ☐ Crayfish
- ☐ Frogs
- ☐ Other bait

3b. In the list above, please circle the type of bait you sell the most.

4. Some baitfish are “certified” disease-free. Do you sell any “certified” disease-free baitfish?

- ☐ No
- ☐ Yes
- ☐ Don't know

5. Where do you get your baitfish? *(Check all that apply.)*

- ☐ Public waters / Wild
- ☐ Private ponds / Farm-raised
- ☐ Other dealers
- ☐ Other sources *(Please list: \_\_\_\_\_)*
- ☐ Don't know

6. Approximately what percentage of your business's gross revenue is attributable to the sale of bait?

\_\_\_\_\_ %

7. Do you think any of the bait you sell is used by anglers fishing in Great Lakes waters? (When we say "Great Lakes waters," we mean the 5 Great Lakes and rivers or streams that run into them or connect them, like the St. Mary's River, Niagara River, or St. Lawrence River. See map on front cover.)

- ☐ No, none  
☐ Yes, some  
☐ Yes, most or all  
☐ Don't know

8. Have you ever heard of the fish disease called VHS (viral hemorrhagic septicemia)?

- ☐ No  
☐ Yes, recognize the name but don't know much about it  
☐ Yes, recognize the name and know something about it

If yes, do you: (Check all that apply.)

- ☐ Buy baitfish that have been tested for the disease  
☐ Have baitfish that you catch tested for the disease

9. Have you ever heard of aquatic invasive species? (By aquatic invasive species, we mean non-native plants and animals such as Eurasian water milfoil, zebra mussels, Asian carp, and round gobies.)

- ☐ No  
☐ Yes, but I don't know much about them  
☐ Yes, I am familiar with them

If yes, do you try to tell if aquatic invasive species are present in baitfish you collect before selling them?

- ☐ No  
☐ Yes  
☐ Not applicable, because I don't collect my own baitfish

**10. How strongly do you agree or disagree with the following statements?** *(Check one box for each statement.)*

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Don't know
The spread of <u>fish diseases</u> is bad for my business	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fish diseases can hurt the species of fish anglers like to fish for	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fish diseases can harm people	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
VHS is a major threat to the health of fish populations in the Great Lakes Region.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The spread of fish diseases is inevitable	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I want to do all I can to prevent the spread of fish diseases	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<u>Aquatic invasive species</u> can harm native fish populations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Aquatic invasive species can reduce the number of fish available for anglers to catch	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The spread of aquatic invasive species is inevitable	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Aquatic invasive species can damage boats or fishing equipment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Aquatic invasive species can prevent use of some areas for boating or swimming	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I have a good understanding of issues related to aquatic invasive species	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



11. Some states and organizations provide information to bait dealers that they can share with their customers about what to do with unwanted baitfish and how to prevent the spread of aquatic invasive species. Do you share this type of information with your customers in any of the following ways? *(Check all that apply.)*

☐ Display signs or posters

→ How many did you have up over the past year? \_\_\_\_\_

☐ Hand out informational materials

→ About how many do you distribute in a year? \_\_\_\_\_

☐ Talk one on one to customers

→ About how many do you talk to in a year? \_\_\_\_\_

*If you don't share information, skip to Question 14.*

12. What does the information focus on? *(Check all that apply.)*

☐ What to do with unwanted baitfish

☐ How to clean fishing equipment to remove aquatic invasive species

☐ How to clean boats and boating equipment to remove aquatic invasive species

13. Do you recall the source(s) of this information?

☐ No

☐ Yes → Please list: \_\_\_\_\_

14. How concerned are you about having fish diseases in the Great Lakes Region?

☐ Very concerned

☐ Moderately concerned

☐ Slightly concerned

☐ Not at all concerned

15. How concerned are you about having aquatic invasive species in the Great Lakes Region?

☐ Very concerned

☐ Moderately concerned

☐ Slightly concerned

☐ Not at all concerned

16. The USDA-APHIS (U.S. Department of Agriculture Animal and Plant Health Inspection Service) regulates the movement of live bait into the U.S. and between states. How familiar are you with USDA-APHIS regulations about bait movement?
- ☐ Very familiar
  - ☐ Moderately familiar
  - ☐ Slightly familiar
  - ☐ Not at all familiar
17. I try to follow the USDA-APHIS regulations:
- ☐ All of the time
  - ☐ Most of the time
  - ☐ Some of the time
  - ☐ Not applicable
18. Some states have regulations about the sale and transport of baitfish to prevent the spread of aquatic invasive species and fish diseases. How familiar are you with the regulations in your state?
- ☐ Very familiar
  - ☐ Moderately familiar
  - ☐ Slightly familiar
  - ☐ Not at all familiar
19. I try to follow my state's regulations about the sale and transport of baitfish:
- ☐ All of the time
  - ☐ Most of the time
  - ☐ Some of the time
  - ☐ Not applicable
20. Has your business ever participated in a training program called AIS-HACCP (Aquatic Invasive Species – Hazard Analysis and Critical Control Point)?
- ☐ No
  - ☐ Yes
  - ☐ Don't know

21. Please indicate the sources from which you have received information about regulations intended to prevent the spread of fish diseases and aquatic invasive species. Also, please indicate how trustworthy you think these sources are. *(Check all that apply.)*

Information Sources	Did you get information from this source? <i>(Check all that apply.)</i>	Trustworthiness of source <i>(Rate each source)</i>		
		Not at all Trustworthy	Somewhat Trustworthy	Very Trustworthy
USDA-APHIS	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
My state's fish and wildlife agency	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other government agencies	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sea Grant	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other bait dealers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Educational institutions (e.g., Universities)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify): _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

22. What are the best ways to reach you with information about new regulations? *(Check all that apply.)*

- ☐ Direct mailing from my state's fish and wildlife agency
- ☐ As part of my bait dealer license form
- ☐ Web site of my state's fish and wildlife agency
- ☐ Web site of USDA-APHIS
- ☐ Conference or workshop
- ☐ iPhone/Smartphone apps
- ☐ Other (please specify): \_\_\_\_\_

**23. How strongly do you agree or disagree with the following statements about the regulations of USDA-APHIS and your state regarding the sale and transport of baitfish? (Check one box for each statement.)**

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Don't know
Regulations about the transport of baitfish are needed to keep fish diseases from spreading	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bait dealers weren't asked for their opinions before current regulations were put in place	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The cost of baitfish has gone up as a direct result of the regulations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The cost of baitfish has nothing to do with the regulations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I sell fewer baitfish because of the regulations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
USDA-APHIS regulations are too complex	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
My state's regulations are too complex	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The regulations are not effective at preventing the spread of fish diseases	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The regulations are unnecessary	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I don't think opinions of bait dealers were seriously considered before current regulations were put in place	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**24. How important is it to you that you follow the regulations of USDA-APHIS and your state regarding transport and sale of baitfish?**

- ☐ Very important
- ☐ Moderately important
- ☐ Slightly important
- ☐ Not at all important

**25. How strongly do you agree or disagree with the following statements about the regulations of USDA-APHIS and your state regarding the sale and transport of baitfish? (Check one box for each statement.)**

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Don't know
It is easy for me to follow the regulations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
It takes too much time to follow the regulations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
It costs too much to follow the regulations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I don't know enough about the regulations to follow them	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Most bait dealers think it is important for us to follow the regulations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Most bait dealers follow the regulations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I trust the opinions of other bait dealers about the importance of following the regulations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I trust my state natural resource agency when it comes to the importance of following the regulations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
If I follow the regulations, that will help limit the spread of fish diseases	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I have a hard time complying with USDA-APHIS regulations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I have a hard time complying with my state's regulations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I don't think USDA-APHIS knows enough about fish diseases and how they are spread	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I don't have the equipment or facilities to follow all the regulations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I think the regulations unfairly burden baitfish dealers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

## **BACKGROUND INFORMATION**

26. Are you male or female? (*Check one.*)    ☐Male    ☐Female

27. In what year were you born?        19\_\_\_\_\_

28. What is the highest level of education you have completed?  
(*Check one.*)

☐ Less than high school

☐ High school diploma / G.E.D.

☐ Some college or technical school

☐ Associate's degree

☐ College undergraduate degree (e.g., B.A., B.S.)

☐ Graduate or professional degree (e.g., M.S., Ph.D., M.D., J.D.)

Please use the space below for any comments you wish to make.

**Thank you for your time and effort!**

To return this questionnaire, simply seal it with the white removable seal,  
and drop it in the mail (return postage has been paid).

## APPENDIX B: ADDITIONAL TABLES

**Appendix Table B-1.** Tests for non-response bias.

Questions	Percent	
	Respondents	Non-respondents
Type of bait business:		
Sell bait wholesale	13.2	8.6
	NS	
Sell bait retail	89.4	97.5
	$(\chi^2 = 12.4, df = 1, p < 0.001)$	
Raise baitfish	4.9	3.6
	NS	
Collect baitfish from public waters	11.8	10.7
	NS	
Do you sell:		
Emerald Shiners	39.2	37.1
	NS	
Golden Shiners	46.8	45.7
	NS	
Fathead Minnows	72.3	67.5
	NS	
Other fish	63.5	61.9
	NS	
Crayfish	22.4	19.3
	NS	
Ever heard of VHS		
No	30.9	42.1
Yes, but don't know much about it	24.1	13.2
Yes, know something about it	45.0	44.7
	$(\chi^2 = 14.1, df = 2, p < 0.001)$	
Ever heard of aquatic invasive species		
No	8.0	12.7
Yes, but don't know much about them	29.9	14.2
Yes, am familiar with them	62.1	73.1
	$(\chi^2 = 20.8, df = 2, p < 0.001)$	
Share information with customers by:		
Display signs or posters	45.9	51.8
	NS	
Hand out informational materials	24.4	35.5
	$(\chi^2 = 9.7, df = 1, p = 0.002)$	
Talk one on one to customers	39.9	67.0
	$(\chi^2 = 45.4, df = 1, p < 0.001)$	
Concern about having fish diseases in the Great Lakes region		
Very concerned	53.2	53.4
Moderately concerned	30.4	28.9
Slightly concerned	13.2	9.1
Not at all concerned	3.2	8.6
	$(\chi^2 = 12.5, df = 3, p = 0.006)$	

**Appendix Table B-1 (cont.)**

	Percent	
	Respondents	Non-respondents
Concern about having AIS in the Great Lakes Region		
Very concerned	61.2	55.8
Moderately concerned	25.1	30.5
Slightly concerned	10.7	6.1
Not at all concerned	3.0	7.6
	$(\chi^2 = 13.7, df = 3, p = 0.003)$	
Familiarity with USDA-APHIS regulations		
Very familiar	11.9	12.2
Moderately familiar	20.6	20.8
Slightly familiar	27.9	23.9
Not at all familiar	39.6	43.1
	NS	
Familiarity with state/province regulations		
Very familiar	31.9	29.4
Moderately familiar	27.3	27.9
Slightly familiar	20.4	17.3
Not at all familiar	20.4	25.4
	NS	
How strongly do you agree or disagree with the following statements:		
I don't think opinions of bait dealers were seriously considered before current regulations were put in place		
Agree	45.7	37.6
Neutral	25.3	39.1
Disagree	6.4	10.1
Don't know	22.6	13.2
	$(\chi^2 = 21.9, df = 3, p < 0.001)$	
Regulations about the transport of baitfish are needed to keep fish diseases from spreading		
Agree	78.0	75.6
Neutral	10.0	12.6
Disagree	7.1	7.7
Don't know	4.9	4.1
	NS	
It costs too much to follow the regulations		
Agree	16.3	19.3
Neutral	31.8	20.8
Disagree	35.3	50.8
Don't know	16.6	9.1
	$(\chi^2 = 22.2, df = 1, p < 0.001)$	
Gender		
Male	75.4	75.1
Female	24.6	24.9
	NS	
	Mean	
Percent of business's gross revenue attributable to the sale of bait	28.4	17.4
	$(t = 4.5, df = 781, p < 0.001)$	



**Appendix Table B-2.** Commonly listed sources of information to hand out to customers by state or province.

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Indiana

Indiana DNR (including fishing regulations)

Michigan

Michigan DNR (including pamphlets, posters, stickers, regulations guide)

Sea Grant

Other bait dealers or wholesalers

New York

New York DEC (including handouts/pamphlets, website, baitfish regulations, baitfish of New York)

Ohio

Ohio DNR

Sea Grant

Ontario

Ontario Ministry of Natural Resource (including handouts, posters, direct mailing)

Workshops (some specifically indicated AIS-HACCP)

Newspapers

Wisconsin

Wisconsin DNR

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